Mathematics (MATH)

Courses

MATH 077. Mathematical Reasoning Workshop. 1 hour.
A refresher of the algebra used in Math 118. A more detailed reminder of algebraic techniques will be given in a student-centered environment with personalized homework and worksheets to address individual needs. Course Information: Satisfactory/Unsatisfactory grading only. No graduation credit. Extensive computer use required. Requires concurrent registration in MATH 118.

MATH 088. Intermediate Algebra Workshop. 1 hour.
Individualized lesson plans including: order of operations, properties of real numbers, linear equations, problem solving, graphing linear equations. Course Information: Satisfactory/Unsatisfactory grading only. No graduation credit. Extensive computer use required. Corequisites: Requires concurrent registration in MATH 108.

MATH 100. Exploring Mathematics, Statistics, and Computer Science. 1 hour.
Introduction to resources and offerings in the Department of Mathematics, Statistics, and Computer Science with a focus on departmental advising procedures and career and post-graduation opportunities. Course Information: Recommended background: After earning credit in at least one mathematics course.

MATH 104. Mathematical Reasoning Workshop. 1 hour.
A refresher of the algebra used in Math 105. A more detailed reminder of algebraic techniques will be given in a student-centered environment with personalized homework and worksheets to address individual needs. Course Information: Satisfactory/Unsatisfactory grading only. Previously listed as MATH 077. Credit is not given for MATH 104 if the student has credit in MATH 077. Requires concurrent registration in MATH 105.

MATH 105. Mathematical Reasoning. 4 hours.
Mathematical problem solving with a hands-on and learn-by-doing approach, using topics from linear equations, personal finance, geometry, probability, and statistics. Course Information: Previously listed as MATH 118. May serve as a prerequisite for statistics courses in the social sciences. It does not replace Math 108 as a prerequisite for any other mathematics department course. Credit is not given for MATH 105 if the student has credit in MATH 118 or MATH 121 or MATH 160 or MATH 165 or MATH 170 or MATH 180 or the equivalent. No graduation credit for architecture, business administration, or engineering students. Prerequisite(s): Credit or concurrent registration in MATH 104; or appropriate score on the department placement test. Course Schedule Information: To be properly registered, students must enroll in one Lecture and one Laboratory-Discussion.

MATH 108. Intermediate Algebraic Concepts. 3 hours.
Linear equations and inequalities, absolute values, linear graphs and modeling, systems of equations, functions, quadratic equations, exponents and polynomials, factoring, radicals and rational exponents. Course Information: Previously listed as MATH 090. Extensive computer use required. Students with credit in a mathematics course at or above the 100-level may not enroll. Prerequisite(s): Credit or concurrent registration in MATH 088; or appropriate score on the department placement test.

MATH 109. College Algebra Workshop. 1 hour.
A refresher of material prerequisite for and used in MATH 110, including: functions, polynomial and rational equations, graphs and transformations, exponentials and logarithms, trigonometry. Course Information: Satisfactory/Unsatisfactory grading only. Prerequisite(s): Appropriate ALEKS placement score. Corequisite(s): Requires concurrent registration in MATH 110.

MATH 110. College Algebra. 4 hours.
Functions, composition and inverses; graphs and transformations, polynomial and rational functions, exponential functions, logarithms and applications; circles and introduction to trigonometry. Course Information: Credit is not given for Math 110 if the student has credit in MATH 121 or MATH 165 or MATH 170 or MATH 180. Extensive computer use required. Prerequisite(s): MATH 090 or MATH 108; credit or concurrent registration in MATH 109; or an appropriate score on the department placement test. Class Schedule Information: To be properly registered, students must enroll in one Lecture and one Laboratory-Discussion.

MATH 121. Precalculus Mathematics. 5 hours.
Functions, graphs, exponentials and logarithms, radicals, complex numbers, trigonometry (circle and triangle approaches), trigonometric graphs and inverses, introduction to polar coordinates and vectors Course Information: No credit will be given for MATH 121 if students have credit in MATH 165 or MATH 170 or MATH 180. Extensive computer use required. Prerequisite(s): Grade of C or better in MATH 110; or appropriate score on the department placement test. Class Schedule Information: To be properly registered, students must enroll in one Laboratory-Discussion and one Lecture.

MATH 122. Emerging Scholars Workshop for Precalculus Mathematics. 1 hour.
Intensive math workshop for students enrolled in MATH 121. Students work together in groups to solve challenging problems. Course Information: Satisfactory/Unsatisfactory grading only. Prerequisite(s): Admission to the Emerging Scholars Program. Must enroll concurrently in MATH 121.

MATH 125. Elementary Linear Algebra. 5 hours.
Introduction to systems of linear equations, matrices and vector spaces, with emphasis on business applications. Course Information: Credit is not given for MATH 125 if the student has credit in MATH 160. Prerequisite(s): Appropriate score on the department placement test; or Grade S in MATH 090 or Grade of C or better in MATH 108; or Grade of C or better in MATH 110; or equivalent. Class Schedule Information: To be properly registered, students must enroll in one Lecture and one Discussion. *Natural World - No Lab course*.

MATH 140. Arithmetic and Algebraic Structures. 4 hours.
Problem solving; algebraic thinking; number systems; numeration; number theory; mathematical operations over natural, integer, and rational numbers; and proportional reasoning. Course Information: Prerequisite(s): Grade of S in MATH 090 or a grade of C or better in MATH 108 or appropriate score on the department placement test.

MATH 141. Algebraic and Geometric Structures. 4 hours.
Area, perimeter, volume, surface area of plane and solid figures; integers, real and rational numbers; trigonometry and extended solution of general polygons; probability. Full purpose calculators used. Course Information: Designed for students in the B.A. in Elementary Education program. Prerequisite(s): Grade of C or better in MATH 140.

MATH 160. Finite Mathematics for Business. 5 hours.
Introduction to probability, statistics, and matrices, with emphasis on business applications. Course Information: Credit is not given for MATH 160 if the student has credit in MATH 125. Prerequisite(s): Appropriate score on the department placement test; or Grade of C or better in MATH 110; or equivalent. Class Schedule Information: To be properly registered, students must enroll in one Discussion/Recitation and one Lecture. *Natural World - No Lab course*.

MATH 165. Calculus for Business. 5 hours.
Introduction to differential and integral calculus of algebraic, exponential and logarithmic functions and techniques of partial derivatives and optimization. Emphasis on business applications. Course Information: Prior credit for MATH 170 or MATH 180 will be lost with subsequent completion of MATH 165. Prerequisite(s): Grade of C or better in MATH 110; or appropriate score on the department placement test. Class Schedule Information: To be properly registered, students must enroll in one Discussion/Recitation and one Lecture. *Natural World - No Lab course*.

MATH 170. Calculus for the Life Sciences. 4 hours.
Introduction to calculus with applications to the life sciences, mathematical modeling, differentiation, integration and applications. Course Information: Prior credit in MATH 165 or MATH 180 will be lost with subsequent completion of MATH 170. Prerequisite(s): Grade of C or better in Math 110 or appropriate score on the department placement test. Class Schedule Information: To be properly registered, students must enroll in one Lecture and one Discussion. *Natural World - No Lab course*.

MATH 178. Preparation for Calculus. 1 hour.
Asynchronous online supplement for some students in Math 180. Uses adaptive individualized assessment and learning to refresh and fill gaps in background knowledge. By invitation only. Course Information: Extensive computer use required. Students eligible to enroll will be contacted by the department. Prerequisite(s): Grade of C or better in MATH 121; or appropriate score on the department placement test; and approval of the department. Corequisites: Requires concurrent registration in MATH 180.

MATH 179. Emerging Scholars Workshop for Calculus I. 1 hour.
Intensive math workshop for students enrolled in MATH 180. Students work together in groups to solve challenging problems. Course Information: Satisfactory/Unsatisfactory grading only. Prerequisite(s): Admission to the Emerging Scholars Program. Must enroll concurrently in MATH 180.

MATH 180. Calculus I. 4 hours.
Differentiation, curve sketching, maximum-minimum problems, related rates, mean-value theorem, antiderivative, Riemann integral, logarithm, and exponential functions. Course Information: Prior credit in MATH 165 or MATH 170 will be lost with subsequent completion of MATH 180. Prerequisite(s): Grade of C or better in MATH 121 or appropriate performance on the department placement test. Class Schedule Information: To be properly registered, students must enroll in one Discussion/Recitation and one Lecture. *Natural World - No Lab course*.

MATH 181. Calculus II. 4 hours.
Techniques of integration, arc length, solids of revolution, applications, polar coordinates, parametric equations, infinite sequences and series, power series. Course Information: Prerequisite(s): Grade of C or better in MATH 180. Class Schedule Information: To be properly registered, students must enroll in one Discussion/Recitation and one Lecture. *Natural World - No Lab course*.

MATH 182. Emerging Scholars Workshop for Calculus II. 1 hour.
Intensive math workshop for students enrolled in MATH 181. Students work together in groups to solve challenging problems. Course Information: Satisfactory/Unsatisfactory grading only. Prerequisite(s): Admission to the Emerging Scholars Program. Must enroll concurrently in MATH 181.

MATH 194. Special Topics in Mathematics. 1-4 hours.
Course content is announced prior to each term in which it is given. Course Information: May be repeated. Prerequisite(s): Approval of the department.

MATH 210. Calculus III. 3 hours.
Vectors in space, functions of several variables, partial differential and optimization, multiple integrals, vector fields, Green's Theorem, Stokes Theorem. Course Information: Prerequisite(s): Grade of C or better in MATH 181. Class Schedule Information: To be properly registered, students must enroll in one Discussion and one Lecture. *Natural World - No Lab course*.

MATH 211. Emerging Scholars Workshop for Calculus III. 1 hour.
Intensive math workshop for students enrolled in MATH 210. Students work together in groups to solve challenging problems. Course Information: Satisfactory/Unsatisfactory grading only. Prerequisite(s): Admission to the Emerging Scholars Program. Must enroll concurrently in MATH 210.

MATH 215. Introduction to Advanced Mathematics. 3 hours.
Introduction to methods of proofs used in different fields in mathematics. Course Information: Prerequisite(s): Grade of C or better in MATH 181 and approval of the department.

MATH 220. Introduction to Differential Equations. 3 hours.
Techniques and applications of differential equations, first and second order equations, Laplace transforms, series solutions, graphical and numerical methods, and partial differential equations. Course Information: Prerequisite(s): Grade of C or better in MATH 210. Class Schedule Information: To be properly registered, students must enroll in one Laboratory-Discussion and one Lecture.

MATH 294. Special Topics in Mathematics. 1-4 hours.
Course content is announced prior to each term in which it is given. Course Information: May be repeated. Prerequisite(s): Approval of the department.

MATH 300. Writing for Mathematics. 1 hour.
Fulfills Writing-in-the-Discipline requirement. Course Information: Prerequisite(s): ENGL 161 or the equivalent, and a grade of C or better in MATH 210. Students must have declared a major in the Mathematics, Statistics, and Computer Science Department.

MATH 310. Applied Linear Algebra. 3 hours.
Matrices, row reduction algorithm, vector spaces, LU-decomposition, orthogonality, Gram-Schmidt process, determinants, inner products, eigenvalue problems, applications to differential equations and Markov processes. Course Information: MATH 310 cannot be used as an elective for the Major in Mathematics. Prerequisite(s): Grade of C or better in MATH 181.

MATH 313. Analysis I. 3 hours.
The real number system, limits, continuous functions, differentiability, the Riemann integral. Course Information: Prerequisite(s): Grade of C or better in MATH 215 or consent of the instructor.

MATH 320. Linear Algebra I. 3 hours.
Linear equations, Gaussian elimination, matrices, vector spaces, linear transformations, determinants, eigenvalues and eigenvectors. Course Information: Prerequisite(s): A grade of C or better in Math 215.

MATH 330. Abstract Algebra I. 3 hours.
Sets, properties of integers, groups, rings, fields. Course Information: Prerequisite(s): Grade of C or better in MATH 215.

MATH 394. Special Topics in Mathematics. 2-4 hours.
Course content is announced prior to each term in which it is given. Course Information: May be repeated. Students may register in more than one section per term. Prerequisite(s): Approval of the department.

MATH 410. Advanced Calculus I. 3 or 4 hours.
Functions of several variables, differentials, theorems of partial differentiation. Calculus of vector fields, line and surface integrals, conservative fields, Stokes's and divergence theorems. Cartesian tensors. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Grade of C or better in MATH 210.

MATH 411. Advanced Calculus II. 3 or 4 hours.
Implicit and inverse function theorems, transformations, Jacobians. Point-set theory. Sequences, infinite series, convergence tests, uniform convergence. Improper integrals, gamma and beta functions, Laplace transform. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Grade of C or better in MATH 410.

MATH 414. Analysis II. 3 or 4 hours.
Riemann-Stieltjes integration. Topology of metric spaces with emphasis on R^n. (Uniform) Continuity of functions on metric spaces. Multi-dimensional differentiation theory. Implicit and Inverse Function Theorem and applications. Introduction to Lebes. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Grade C or better in MATH 313 and MATH 310, or MATH 320.

MATH 417. Complex Analysis with Applications. 3 or 4 hours.
Complex numbers, analytic functions, complex integration, Taylor and Laurent series, residue calculus, branch cuts, conformal mapping, argument principle, Rouche's theorem, Poisson integral formula, analytic continuation. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Grade C or better in MATH 210.

MATH 419. Models in Applied Mathematics. 3 or 4 hours.
Introduction to mathematical modeling; scaling, graphical methods, optimization, computer simulation, stability, differential equation models, elementary numerical methods, applications in biology, chemistry, engineering and physics. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Grade of C or better in MATH 220 and grade of C or better in MCS 260.

MATH 425. Linear Algebra II. 3 or 4 hours.
Canonical forms of a linear transformation, inner product spaces, spectral theorem, principal axis theorem, quadratic forms, special topics such as linear programming. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Grade of C or better in MATH 320.

MATH 430. Formal Logic I. 3 or 4 hours.
First order logic, syntax and semantics, completeness-incompleteness. Course Information: 3 undergraduate hours. 4 graduate hours. Credit is not given for MATH 430 if the student has credit for PHIL 416. Prerequisite(s): Grade of C or better in CS 202 or grade of C or better in MCS 261 or grade of C or better in MATH 215.

MATH 431. Abstract Algebra II. 3 or 4 hours.
Further topics in abstract algebra: Sylow Theorems, Galois Theory, finitely generated modules over a principal ideal domain. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Grade of C or better in MATH 320 and grade of C or better in MATH 330.

MATH 435. Foundations of Number Theory. 3 or 4 hours.
Primes, divisibility, congruences, Chinese remainder theorem, primitive roots, quadratic residues, quadratic reciprocity, and Jacobi symbols. The Euclidean algorithm and strategies of computer programming. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Grade of C or better in MATH 215.

MATH 436. Number Theory for Applications. 3 or 4 hours.
Primality testing methods of Lehmer, Rumely, Cohen-Lenstra, Atkin. Factorization methods of Gauss, Pollard, Shanks, Lenstra, and quadratic sieve. Computer algorithms involving libraries and nested subroutines. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Grade of C or better in MATH 435.

MATH 442. Differential Geometry of Curves and Surfaces. 3 or 4 hours.
Frenet formulas, isoperimetric inequality, local theory of surfaces, Gaussian and mean curvature, geodesics, parallelism, and the Guass-Bonnet theorem. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Grade of C or better in MATH 320.

MATH 445. Introduction to Topology I. 3 or 4 hours.
Elements of metric spaces and topological spaces including product and quotient spaces, compactness, connectedness, and completeness. Examples from Euclidean space and function spaces. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Grade of C or better in MATH 313.

MATH 446. Introduction to Topology II. 3 or 4 hours.
Topics in topology chosen from the following: advanced point set topology, piecewise linear topology, fundamental group and knots, differential topology, applications to physics and biology. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Grade of C or better in MATH 445.

MATH 480. Applied Differential Equations. 3 or 4 hours.
Linear first-order systems. Numerical methods. Nonlinear differential equations and stability. Introduction to partial differential equations. Sturm-Liouville theory. Boundary value problems and Green's functions. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Grade of C or better in MATH 220.

MATH 481. Applied Partial Differential Equations. 3 or 4 hours.
Initial value and boundary value problems for second order linear equations. Eiqenfunction expansions and Sturm-Liouville theory. Green's functions. Fourier transform. Characteristics. Laplace transform. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Grade of C or better in MATH 220.

MATH 494. Special Topics in Mathematics. 3 or 4 hours.
Course content is announced prior to each term in which it is given. Course Information: 3 undergraduate hours. 4 graduate hours. May be repeated. Students may register in more than one section per term. Prerequisite(s): Approval of the department.

MATH 496. Independent Study. 1-4 hours.
Reading course supervised by a faculty member. Course Information: May be repeated. Students may register in more than one section per term. Prerequisite(s): Approval of the instructor and the department. Class Schedule Information: This course counts toward the limited number of independent study hours accepted toward the degree and the major.